

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Before the Board of Patent Appeals and Interferences

In re the Application

Applicant(s) : BOERNER *et al.*  
Application No. : 10/579,413  
Filed : February 20, 2007  
Title : LIGHT-EMITTING DEVICE WITH AN IRIIDIUM  
COMPLEX

REPLY BRIEF

On Appeal from Group Art Unit 1786

Sir:

This is a reply brief from the Examiner Answer dated April 13, 2011. This Brief is responsive to new points raised in the Examiner's Answer.

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Date: June 8, 2011

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## **EXAMINER'S ANSWER SECTIONS (1)-(9) & (11)**

The Appellant and the Examiner appear to be in agreement concerning Sections (1)-(5), (7)-(8), and (11) of the Appeal Brief and the Examiner's Answer, regarding Sections (6) and (9) the Examiner maintains the previous rejections.

## **EXAMINER'S ANSWER SECTION (10) – RESPONSE TO ARGUMENT**

### **Rejections under 35 U.S.C. § 103(a)**

As previously indicated, appellants respectfully submit that the rejection of claims 1-6 and 8-10 under 35 U.S.C. §103(a) as being unpatentable over JP 2003-007467 A (hereinafter 'Tsuge') in view of U.S. Application Publication No. 2004/0076853 (hereinafter 'Jarikov') and claim 7 under 35 U.S.C. 103(a) as being unpatentable over Tsuge et al. in view of Jarikov and Furugori et al (US 2003/0141809 A1) is in error.

It is respectfully submitted that in order to establish a *prima facie* case of obviousness, three basic criteria must be met;

1. there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine the reference teachings;
2. there must be a reasonable expectation of success; and

3. the prior art reference must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must be found in the prior art, and not based on applicant's disclosure. *In re Vaec*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)

In *KSR Int'l. Co. v. Teleflex, Inc.*, the Supreme Court noted that the analysis supporting a rejection under 35 U.S.C. 103(a) should be made explicit, and that it is "important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the [prior art] elements" in the manner claimed:

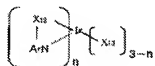
"Often, it will be necessary ... to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an **apparent reason** to combine the known elements in the fashion claimed by the patent at issue. To facilitate review, this analysis **should be made explicit**." *KSR*, 82 USPQ2d 1385 at 1396 (emphasis added).

Further, MPEP 2143 states:

"If the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification."

Claim 1 recites: a “light-emitting device, comprising at least a substrate (1), an anode (2), a light-emitting layer (4) and a cathode (6), wherein the light-emitting layer (4) includes an iridium complex IrL<sub>3</sub> and wherein at least two ligands L are a dibenzoquinoline.” An independent claim 8 recites similar limitations

In support of the rejection, the Final Office Action and Examiner’s Answer indicates that the disclosure of Tsuge et al. is directed to the construction of organic EL devices and specifically discloses the use of iridium complexes of the following form:



As “doping agents (Claim 9) in the light-emitting layer of the device. Thus, one skill in the art would easily be motivated to take into account the disclosure of Tsuge et al. for the use of iridium complexes as doping agents. Appellants respectfully disagree.

As the Office has recognized, “[t]he fact that a claimed compound may be encompassed by a disclosed generic formula does not by itself render that compound obvious.” *In re Baird*, 16 F.3d 380, 382 (Fed. Cir. 1994). See also MPEP §2144.08(II). To provide the further basis required to establish the asserted *prima facie* obviousness of claim 1, the Final Office Action notes that the claimed dibenzoquinoline compounds and the benzoquinoline compounds disclosed in Tsuge are homologs and that Tsuge discloses

the possibility of producing fused homologs in formulas 48 and 50, reproduced herein below, respectively:

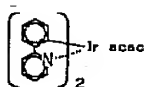


While the Final Office Action has presented a clever argument when viewed in isolation, it should be noted that “when ‘all of the disclosures in a reference’ are considered, the overall suggestion to emerge from the prior art reference may be contrary to that which might appear from an isolated portion of the reference.” *In re Langer*, 465 F.2d 896, 899 (CCPA 1972). Moreover, “homology should not be automatically equated with prima facie obviousness,” as the prior art as a whole must be compared with the claimed subject matter as a whole. *Id.* at 898-899.

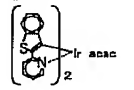
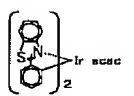
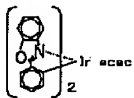
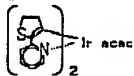
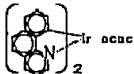
It is respectfully submitted that when the cited reference is viewed as a whole, the overall suggestion of the reference runs contrary to the use of dibenzoquinoline as ligands of an iridium complex.

Moreover, it should first be noted that Tsuge, as discussed in the Amendment submitted on May 5, 2010, is primarily directed to addressing uneven distribution of a host agent toward the cathode side of a device during operation (Tsuge, para. 7). In particular, Tsuge provides only a very short description of doping agents that can be used in an electroluminescent device.

Where Tsuge does describe doping agents, Tsuge mentions the following general formulas of the doping agents that can be used:



and briefly provides the following respective variations of such formulas:



(Tsuge, column 12, line 12, to column 13, line 40).

Each of the variations provided by Tsuge reveals a consistent pattern of dopants in which, at most, only one ring is added to the base 2-phenyl-pyridine. Thus, in view of the teachings of Tsuge as a whole, one of ordinary skill in the art would at best search for variations of the base 2-phenyl-pyridine that have only one additional aromatic ring. Tsuge does not in any way suggest adding more than one ring to the base 2-phenyl-pyridine to synthesize an iridium complex with dibenzoquinoline ligands, as claimed.

The Examiner's Answer indicates that it is the position of the Examiner that it would have been obvious to modify the benzoquinoline ligand as disclosed by Tsuge et al. to that of a dibenzoquinoline ligand in the iridium complex. The addition of the additional benzene ring is not a big leap or inventive change. Appellants respectfully disagree.

Appellants believe it is not trivial to connect a given ligand like dibenzochinoline to Iridium. Many things can go wrong and have gone wrong, such as reactions stopping at an intermediate step, or insolubility of intermediate or final compounds. One of the inventors of the present invention, Herbert Boerner, recalls that the extra benzene ring in dibenzochinoline reduces the solubility of the complex very much, so it was nontrivial to isolate it properly. On the other hand, (surprisingly) it enhances the stability of the complex against reduction.

Still further, it is respectfully submitted that it would not be obvious in view of Tsuge as a whole to employ dibenzoquinoline ligands in an iridium complex for several

reasons. First, Tsuge is primarily directed to problems associated with a host agent and provides only a minimal description with regard to iridium complexes used in a dopant. Thus, any reference to Tsuge for teachings on iridium complexes by one of ordinary skill in the art is relatively unlikely. Second, Tsuge teaches the use of iridium complex dopants in which only one ring is added to the base 2-phenyl-pyridine, whereas the claimed complex employs dibenzoquinoline ligands with at least four rings. Third, Tsuge's brief description of iridium complexes does not in any way suggest any reason for diverting from the disclosed pattern of dopants to add more than one ring to the base 2-phenyl-pyridine.

The Examiner's Answer further indicates that the modification to arrive at dibenzoquinoline from benzoquinoline would only involve a homologous change in the original structure in the periphery (i.e., addition of an extra fused benzene ring) while maintaining the core three-ring fused structural unit and that the resulting compound (i.e., dibenzoquinoline) would be 1) fully encompassed by the Tsuge et al.'s general formula and 2) expected to have similar chemical and physical properties without destroying the light-emitting properties of the iridium complex. As noted above, Appellants respectfully disagree. As note above, one of the inventors of the present invention, Herbert Boerner, recalls that the extra benzene ring in dibenzochinoline reduces the solubility of the complex very much, so it was nontrivial to isolate it properly. On the other hand, (surprisingly) it enhances the stability of the complex against reduction. Thus, with respect to the claimed complex, the inventor notes an unexpected result. As such, it is respectfully



submitted that it would not be obvious to modify the iridium complex dopant of Tsuge to produce an iridium complex with dibenzoquinoline ligands, as recited in claim 1.

Furthermore, with regard to the mention of Jarikov in the Office Action, the Examiner has recognized, in view of the Applicant's arguments, that a host serves an entirely different function than dopants of a luminous layer of an organic electroluminescent device (see, e.g., Final Office Action, p. 5, para. 2). Specifically, the doping agent functions as a phosphorescence emitter while the host agent acts as an exciton that excites the doping agent, thereby inducing phosphorescent emission (see Tsuge, paras. 6 and 17). Thus, despite Jarikov's disclosure of utilizing dibenzoquinolines as a host material in organic EL devices, it is respectfully submitted that Jarikov provides no teaching or suggestion whatsoever for employing dibenzoquinolines in a dopant. Indeed, if Jarikov should be combined with Tsuge, Jarikov's description of employing dibenzoquinoline as a host would at best teach away from using dibenzoquinoline in the dopant of Tsuge. As such, it would not be obvious to use dibenzoquinolines in the iridium complex dopant described in Tsuge in view of Jarikov.

Therefore, the Applicant respectfully requests the withdrawal of the rejection of claim 1 for at least the reasons discussed above.

With regard to claim 8, claim 8 also recites an iridium complex  $\text{IrL}_3$  in which at least two ligands L are dibenzoquinolines. As discussed above, neither reference, taken

singly or in combination, discloses the use of such an iridium complex nor is it obvious to devise such an iridium complex in view of the references. As such, the cited references do not render claim 8 unpatentable. Thus, withdrawal of the rejection and allowance of the claims is respectfully requested.

With regard to the dependent claims 2-7 and 9-10 these claims ultimately depend from one of the independent claims, which have been shown to be allowable in view of the cited references. Accordingly, claims 2-7 and 9-10 are also allowable by virtue of their dependence from an allowable base claim.

For the reasons set forth above, in the Appeal Brief, and in the Reply Brief, it is submitted that no claims are anticipated by any of the references of record and that all claims are patentable over the references of record.

An early Decision reversing the Examiner's rejection of all claims is requested.

Respectfully submitted,

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